

# Cost-Benefit Ramifications Of PACS: Do The Dollars Make Sense?

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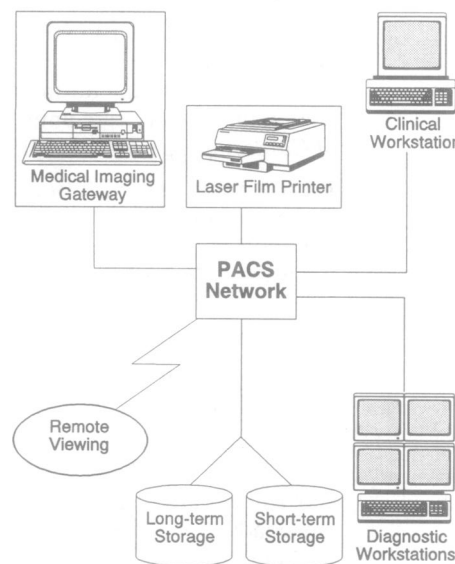
**Introduction.** Picture Archiving and Communication System (PACS) technology has been in development since the 1970s, though first generation systems were very rudimentary. Since that time, the crucial issue of cost has stilted widespread implementation, primarily due to the concern that there would be insubstantial clinical and managerial benefit for considerable financial output. Even today one cannot justify PACS on purely economic considerations. However, hardware costs are going down, specialty technology is improving, and the PACS supplier community is starting to stabilize. Also, as health care institutions become motivated to move to Integrated Delivery Systems (IDS) and Community Health Information Networks (CHIN), the implementation of a PACS project could become a requisite technology, one that can be at least partially justified as the cost of doing business.

The focus of this article is on the following issues: PACS dominates the vision of the Radiology professionals, even though its implementation cannot be justified at this time based on savings achieved; in any event, technology and costs often limit the clinicians' PACS choice to imperfect high resolution images, and no one vendor can supply all PACS components. However, as organizations continue to become more geographically distributed and affiliations proliferate, PACS will become an essential centerpiece of a mandatory teleradiology initiative.

**What Is PACS?** PACS is a filmless technology which consists of five fundamental components, shown in [Figure 1](#):

1. Photoactivated plates that capture undeveloped radiologic images in digital form, rather than on traditional plain film,
2. Storage of these images on optical disks,
3. Management and distribution of the images through a database management system and network,
4. Enhancements of the image quality through the application of technology, and
5. Provisions for the diagnosis of the images via electronic softcopy viewing on high resolution workstations.

**Figure 1**  
PACS Configuration



In effect, PACS acquires images provided by a multiplicity of imaging modalities, listed in [Figure 2](#), stores and distributes the enhanced image, allowing the clinician to view, manipulate, and read the image achieving a greater quality diagnosis than available through conventional film-based technologies.

**Figure 2**

MEDICAL IMAGING MODALITIES	
<ul style="list-style-type: none"><li>• Angiography</li><li>• Cineangiography</li><li>• Computed Radiology</li><li>• Computed Tomography</li><li>• Digital Subtraction Angiography</li><li>• Film Digitizer</li><li>• Magnetic Resonance Imaging</li><li>• Mammography</li><li>• Nuclear Cardiology</li><li>• Nuclear Medicine</li><li>• Ultrasound</li><li>• Vascular Imaging</li></ul>	

**Perceived PACS Benefits.** PACS addresses notable problems with conventional film systems. Since the image is captured in digital form, multiple views can be simultaneously and remotely displayed. Repeat procedures rarely need to be performed because of the ability to rebalance and enhance the image, alleviating the impact of technical and procedural deficiencies, as well as the elimination of lost films. Tracking of the images is materially expedited through the archiving management system. Time is saved by clinicians through the remote distributed access provisions, and staffing of the file library could potentially be reduced.

The following statistics reflect the needs for a capability such as that inherent in the PACS concept:

- It is estimated that 50-to-70 percent of patients will require diagnostic imaging procedures. It is evident that PACS technology would affect a great majority practitioners and their patients.
- Referring physicians need to access multi-modality studies about 30 percent of the time, a capability that only PACS can effectively provide.
- Referring physicians spend approximately 60-to-90 minutes per week traveling to and from the file room. PACS would eliminate this inefficiency.
- Twenty-five percent of the films requested by practitioners cannot be retrieved within three hours, and as a result about 20 percent of the films are not compared to their predecessors. Again, PACS would address this problem.
- Five percent of the films, and as many as 30 percent of films in the Emergency Room, must be repeated due to their unavailability or poor technical quality. PACS will address the former, and partially alleviate the latter deficiency.
- Forty percent of images are not reviewed within 24 hours, at least partially to their unavailability which will be corrected by PACS.

Obviously, there are many inefficiencies which PACS could potentially help to alleviate. Moreover, a PACS solution provides up to an 80 percent reduction in file space required for images.

Additional opportunities for benefits include the following:

- Reducing the number of radiologists on staff, or making available expertise more accessible
- Reducing staff currently supporting storage and retrieval of films

- Minimizing the time spent by on-call radiologists returning to the medical facility to view images
- Reducing the time for a radiologist to review an individual case

**PACS Return-On-Investment.** Demand for PACS dominates the wish lists of many Radiology Departments. Typically, the requests first address the implementation of PACS across Radiology, with subsequent expansion to the Emergency Room and Intensive Care environments. Administrative concerns and resistance to PACS focus on costs, soft and possibly non-realizable benefits, supply-side instability, and several open legal and socioeconomic issues.

PACS is acknowledged to be a very expensive technology. A limited PACS pilot installation across Radiology and linking the Emergency Room is likely to require capital of \$2-to-\$3 million, and incur incremental annual operating costs in excess of \$400,000. At 200,000 procedures per year, a capital cost of \$8-to-\$12 million can be anticipated for a fully deployed PACS. These costs can be understood when one considers that a diagnostic workstation with eight 2,000 by 2,500 pixel monitors could cost as much as \$200,000.

A multitude of studies, many of which have been done by self-serving parties in support of PACS, have attempted to identify realizable and achievable quantifiable benefits. It has become evident that most hard savings are increased staff productivity, space, and reduction in film costs. Increased maintenance costs are being projected for the high technology PACS installation. Virtually all of these studies have estimated a seven-to-14 year payback. Further, most have not taken into account the likely early obsolescence of current hardware offerings as improved technology becomes available.

Today's PACS capital costs reflect over a 70 percent hardware component. Much of this first and second generation hardware is proprietary, and most PACS configurations represent the contribution of several vendors. While hardware costs are rapidly decreasing and the technology is improving, most purchasers must assume an unusually short life cycle, with their current acquisition representing a pilot experiment. In addition, much of the more promising technology is being provided by small, startup vendors, whose long-term viability is questionable. Unfortunately, the software is seldom transferable across available specialty hardware.

Other concerns regarding PACS exist. For example, some radiologists resist PACS because of inherent job security concerns -- this is natural as their onsite presence will be replaced by remote facilities serving multiple client organizations. There may be less patient contact, the availability of multiple modality images will increase the time needed for interpretation, and original images will not be

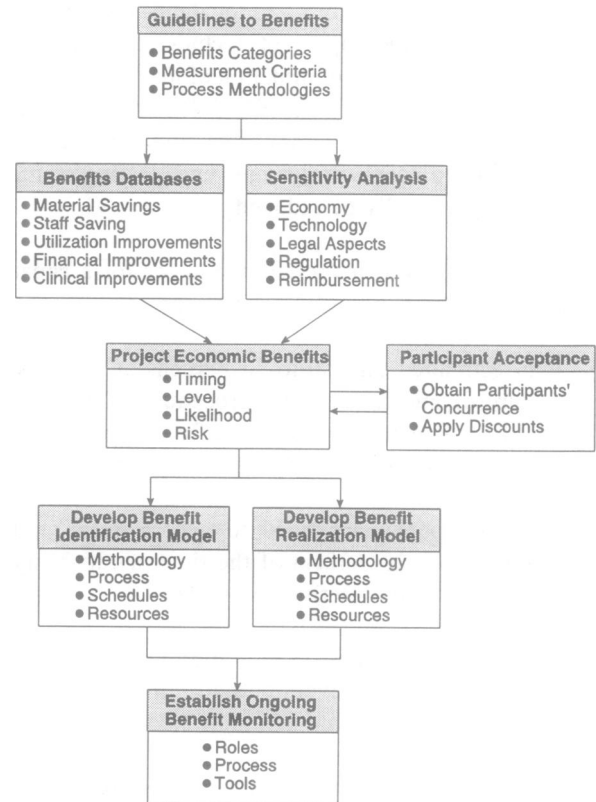
available at the reading sites with resulting implications for malpractice determinations.

**Benefit Determination Process.** Until the tangible savings are demonstrated by an impartial authority, PACS is going to be constrained in most situations by its economics. The selected methodology and processes which potential user organizations adopt should incorporate the following considerations:

- The selected methodology must provide for a quantitative means for reflecting the likelihood of realizing potentially achievable benefits.
- The processes must include both prospective projections and retrospective assessment. Both of these processes should be applied to a limited pilot before expansion is authorized. The pilot should be selected so it is, in itself, of value even if no further expansion occurs.
- The economic projections should be subject to a sensitivity analysis indicating possible changes in the economy, regulation, reimbursement, and technology.
- Both Administration and Radiology's management must be willing to assume "ownership" of the methodology, processes, and outcome before results are provided.
- The widest possible continuum of care should be considered in identifying the scope of the processes.

**FIGURE 3**

**Proposed PACS Benefit Determination Methodology**



The proposed benefit determination methodology is composed of tasks shown in [Figure 3](#). This methodology should help to clarify whether or not the quantifiable and other benefits are achievable. There are some additional factors, however, that may foster support for a PACS implementation, but do not purport orthodox cost-benefit indicators. For example, to become a viable player in the health care market ("cost of doing business"), a PACS project may become a necessity. In order to draw high-quality physicians or to compete for patients, it may be imperative to install a PACS.

**Conclusion.** PACS will become a mandatory wrap-around technology to be incorporated in most aggressive IDS and CHIN organizations. However, while its current deployment may be justifiable under the cost of doing business, it is clear that today's PACS capital and ongoing costs are likely to result in an unusually long seven-year plus payout. In addition, while technology is rapidly improving and costs are going down, it is unlikely that currently available technology and vendor stability will provide the five-to-seven year life cycle anticipated from most technology applications.